Electronic Version
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Claims

[c1] A multilayer ceramic substrate with a single via anchored pad comprising:
a first ceramic layer having a metal-filled via and an outer surface;
an outer pad adjacent to the outer surface of the first ceramic layer, the outer pad adhered to the metal-filled via in the first ceramic layer;
a second ceramic layer adjacent to the first ceramic layer having a metal-filled via adhered to the metal-filled via in the first ceramic layer, the metal-filled via in the second ceramic layer being larger in crossection than the metal-filled via in the first ceramic layer, wherein there is only one metal-filled via in each of the first and second ceramic layers to anchor the outer pad to the multilayer ceramic substrate; and
a third ceramic layer adjacent to the second ceramic layer having a metal-filled via adhered to the metal-filled via in the second ceramic layer.

[c2] The multilayer ceramic substrate of claim 1 wherein the metal-filled vias in the first and second ceramic layers are cylindrical shaped.

[c3] The multilayer ceramic substrate of claim 2 wherein the metal-filled via in the second ceramic layer is at least two mils in diameter greater than the metal-filled via in the first ceramic layer.

[c4] The multilayer ceramic substrate of claim 2 wherein a diameter of the metal-filled via in the first ceramic layer is equal to or greater than a diameter of the metal-filled via in the third ceramic layer.

[c5] The multilayer ceramic substrate of claim 1 wherein the metal-filled vias in the first and second ceramic layers comprise a copper/nickel alloy.

[c6] The multilayer ceramic substrate of claim 1 wherein the metal-filled vias in the first and second ceramic layers are 100 volume percent metal.

[c7] The multilayer ceramic substrate of claim 1 wherein the metal-filled vias in the first and second ceramic layers and the outer pad are 100 volume percent metal.

[c8] The multilayer ceramic substrate of claim 1 wherein the metal-filled via in the third ceramic layer is a composite via comprising a mixture of ceramic and metallic materials.

[c9] The multilayer ceramic substrate of claim 1 further com-

prising an interlayer pad between the metal-filled vias in the second and third ceramic layers.

[c10] A multilayer ceramic substrate with a single via anchored pad comprising:
a first ceramic layer having a metal-filled via and an outer surface, the metal-filled via having a first contact surface;
an outer pad adjacent to the outer surface of the first ceramic layer, the outer pad adhered to the metal-filled via in the first ceramic layer;
a second ceramic layer adjacent to the first ceramic layer having a metal-filled via with a second contact surface, the metal-filled via in the second ceramic layer adhered to the metal-filled via in the first ceramic layer through the first and second contact surfaces, wherein the second contact surface is larger than the first contact surface and wherein there is only one metal-filled via in each of the first and second ceramic layers to anchor the outer pad to the multilayer ceramic substrate; and
a third ceramic layer adjacent to the second ceramic layer having a metal-filled via adhered to the metal-filled via in the second ceramic layer.

[c11] The multilayer ceramic substrate of claim 10 wherein the contact surfaces in the first and second ceramic layer are circularly shaped.

[c12] The multilayer ceramic substrate of claim 11 wherein the contact surface in the second ceramic layer is at least two mils in diameter greater than the contact surface in the first ceramic layer.

[c13] The multilayer ceramic substrate of claim 11 wherein a diameter of the metal-filled via in the first ceramic layer is equal to or greater than the diameter of the metal-filled via in the third ceramic layer.

[c14] The multilayer ceramic substrate of claim 10 wherein the metal-filled vias in the first and second ceramic layers comprise a copper/nickel alloy.

[c15] The multilayer ceramic substrate of claim 10 wherein the metal-filled vias in the first and second ceramic layers are 100 volume percent metal.

[c16] The multilayer ceramic substrate of claim 10 wherein the metal-filled vias in the first and second ceramic layers and the outer pad are 100 volume percent metal.

[c17] The multilayer ceramic substrate of claim 10 wherein the metal-filled via in the third ceramic layer is a composite via comprising a mixture of ceramic and metallic materials.

[c18] The multilayer ceramic substrate of claim 10 further

comprising an interlayer pad between the metal-filled vias in the second and third ceramic layers.